Patent Claims

1. Internal combustion engine, especially Diesel engine, with
   - an exhaust gas line (2) in which an NO_X reduction catalytic converter (3) is arranged; and with
   - a reducing agent-generating unit (20) for the generation of H_2-containing and NH_3-containing reducing gas, which can be added upstream of the NO_X reduction catalytic converter (3) in the exhaust gas line (2), whereby the reducing agent-generating unit (20) can be supplied with an HC-containing fuel, as well as air, and/or exhaust gas,

   characterized in that

   the reducing agent-generating unit (20) has an NO_X generation step (22), and an H_2 generation step (21; 25) in serial arrangement.

2. Internal combustion engine according to claim 1,

   characterized in that the NO_X generation step (22) is arranged downstream from the H_2 generation step (21; 25).

3. Internal combustion engine according to claim 1,

   characterized in that the NO_X generation step (22) is arranged upstream from the H_2 generation step (21; 25).

4. Internal combustion engine according to one of the claims 1 to 3,

   characterized in that the NO_X generation step (22) is arranged downstream from the NH_3 generation step (24; 25; 26).

5. Internal combustion engine according to one of the preceding claims,

   characterized in that a fractioning unit (27) is arranged to the reducing agent-generating unit (20) in such a way that low-boiling components of a fuel used for the operation of the internal combustion engine (1) can be separated by the fractionation unit (27), which can be supplied to the H_2 generation step (21; 25).

6. Internal combustion engine according to one of the preceding claims,

characterized in that the reducing agent-generating unit (20) can be operated alternately in two operating modes in such a way, that during the first operating mode of the NO_X generation step (22), an NO_X-containing gas can be produced, and in the second operation mode, an H_2-containing and NH_3-containing reducing gas can be produced by the reducing agent-generating unit (20).

7. Internal combustion engine according to claim 6,
characterized in that an NO_X intermediate storage unit (23; 26) is arranged downstream from the NO_X generation step (22).

8. Internal combustion engine according to claim 7,
characterized in that the NO_X intermediate storage unit (26) is designed for the reaction of stored NO_X with H_2 to NH_3.

9. Internal combustion engine according to one of the claims 3 to 5,
characterized in that the H_2 generation step (21; 25) is designed for the reaction of supplied NO_X into NH_3.

10. Internal combustion engine according to one of the preceding claims,
characterized in that the NO_X generation step (22) is designed for the generation of NO_X from air and/or oxygen-containing exhaust gas.

11. Internal combustion engine according to one of the preceding claims,
characterized in that the NO_X reduction catalytic converter (3) has a denox catalytic converter step (3b) for the reaction of NO_X with H_2, and an SCR catalytic converter step (3a) for the reaction of NO_X with NH_3.

12. Procedure for the operation of an internal combustion engine, especially a Diesel engine, with
- a reducing agent-generating unit (20), and with
- an exhaust gas line (2) in which an NO_X reduction catalytic converter (3) is arranged,

whereby a reducing gas produced by the reducing agent-generating unit (20) is added upstream from the NO_X reducing catalytic converter (3) to the exhaust gas,
characterized in that
the reducing gas generation comprises the following generation steps:

a) Generation of an NO_X-containing gas from an NO_X generation step (22) allocated to the reducing agent-generating unit (20) from the air and/or exhaust gas supplied to the NO_X generation step (22);

b) Intermediate storage of NO_X when conducting the NO_X-containing gas produced in operation a through an NO_X intermediate storage unit (23; 26), which is arranged downstream from the NO_X generation step (22), and arranged to the reducing agent-generating unit (20);

c) Generation of an H_2-containing gas by an H_2 generation step (21) allocated to the reducing agent-generating unit (20), and arranged downstream from the intermediate storage unit (23; 26), from the fuel, as well as air, and/or exhaust gas supplied to the H_2 generation step (21);

d) Reaction of NO_X stored in the NO_X intermediate storage unit (23; 26) with the gas produced in operating c into NH_3, so that an H_2-containing, and NH_3 -containing reducing gas is produced;

whereby the operations a and b are performed alternately with the operations c and d.

13. Procedure for the operation of an internal combustion engine, especially a Diesel engine, with

- a reducing agent-generating unit (20), and with
- an exhaust gas line (2) in which an NO_X reduction catalytic converter (3) is arranged,

whereby a reducing gas produced by the reducing agent-generating unit (20) is added upstream of the NO_X reducing catalytic converter (3) to the exhaust gas,

characterized in that the

reducing gas generation consists of the following generation steps:

a) Generation of an NO_X-containing gas from an NO_X generation step (22) allocated to the reducing agent-generating unit (20) from the air, and/or exhaust gas supplied to the NO_X generation step (22);

b) Generation of an H_2-containing and an NH_3-containing reducing gas from an H_2 generation step (21) allocated to the reducing agent-generating unit (20), and arranged downstream from the NO_X generation step (21) from NO_X supplied to the H_2 generation step (21) containing gas produced in operation a, supplied fuel, as well as air, and/or exhaust gas;

14. Procedure according to claim 12,

characterized in that the NO_X reaction into NH_3 takes place in the catalytic NH_3 generation step (24), which is arranged to the reducing agent generation unit (20), and arranged downstream to the NO_X intermediate storage unit (24).

15. Procedure according to claim 12,

characterized in that the NO_X intermediate storage of NO_X, and the NO_X reaction into NH_3 is performed with a catalytic NO_X intermediate storage unit (26).

16. Procedure according to one of the claims 12 to 15,

characterized in that in a fractioning unit (27) allocated to the reducing agent-generating unit (20) a fuel enriched with low-boiling components is obtained in a fractionating unit (27) allocated to the reducing agent-generating unit (20), which is supplied to the reducing agent-generating unit (20) for the generation of reducing gas.

17. Procedure according to one of the claims 12 to 16,

characterized in that the NO_X reducing catalytic converter (3) is divided into a denox catalytic converter step (3b) for the reaction of NO_X with H_2, and into an SCR catalytic converter step (3a) for the reaction of NO_X with NH_3, and the reducing gas is supplied to the exhaust gas as a function of its composition at the input side to the SCR catalytic converter step (3a), or on the input side to the denox catalytic converter step (3b).

18. Procedure according to one of the claims 12 to 17,

characterized in that the amount and/or the composition of the reducing gas produced by the reducing agent-generating unit is set as a function of the operating status of the internal combustion engine.